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**Jefferson Proving Ground
South of the Firing Line**

Revised Technical Memorandum

**Proposed Assessment and Measurement Endpoints
for the Detailed Ecological Risk Assessment**

September 1997

**Rust Environment and Infrastructure
Grand Junction, Colorado 81506**

20070424290

**Prepared for
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010-5401
under
Contract No. DAAA15-90-D-0007**

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ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DERA	Detailed Ecological Risk Assessment
FS	Feasibility Study
HI	hazard indices
HQ	hazard quotients
IDEM	Indiana Department of Environmental Management
IM	Interim Measures
JPG	Jefferson Proving Ground
mg/kg	milligram per kilogram
PERA	Preliminary Ecological Risk Assessment
PRG	Preliminary Remedial Goal
RBP	Rapid Bioassessment Protocol
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
Rust E&I	Rust Environment and Infrastructure
SMDP	Scientific Management Decision Point
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance

EXECUTIVE SUMMARY

This document supports the Ecological Risk Assessment for the Remedial Investigation/ Feasibility Study (RI/FS) conducted at sites located south of the Firing Line at Jefferson Proving Ground (JPG), Madison, Indiana. The RI/FS is being conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Approximately 24 sites or groups of sites were identified in the revised Draft Preliminary Ecological Risk Assessment (PERA) as potentially posing an ecological risk to site flora and/or fauna. Additional investigation is needed to further define these potential risks to the environment.

A draft version of this document was issued in June 1997. The contents of the draft document were based on discussions held during a site meeting of April 17, 1997, and subsequent conference calls on April 21, 1997 and April 24, 1997 with representatives from the CERCLA and Resource Conservation and Recovery Act (RCRA) branches of the U.S. Environmental Protection Agency (USEPA), CH2M Hill (USEPA Contractor), U.S. Army Environmental Center (USAEC), U.S. Army Corps of Engineers - Louisville District (USACE), U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), and Rust Environment & Infrastructure (Rust E&I). The draft Technical Memorandum was subsequently discussed during a meeting at USEPA Region 5 Headquarters on August 14, 1997 with the same participants, as well as the Indiana Department of Environmental Management (IDEM). The minutes of this latter meeting are included as Appendix A to this document. Based on these subsequent discussions, this revised Technical Memorandum has been produced.

A suggestion for field studies proposed by the USEPA during the August 1997 meeting (Appendix A) was not implementable for several reasons. During that meeting, the USEPA had suggested plant and earthworm toxicity tests using soil from one or two sites that had not been plowed and which represented all of the contaminants of concern (COCs). In addition, metals would be analyzed on those soils, and the soil fauna identified. Ten samples were considered appropriate for statistical evaluation. No reference area for comparison had been proposed. The primary reason that the USEPA proposal could not be implemented is that there are different soil types across the JPG. Soil type is a key factor in the outcome of plant and earthworm toxicity testing. In addition, the COCs could not be adequately represented by one or even two sites. The uncertainty associated with possible application of agricultural chemicals on the areas currently under cultivation was also considered. As a result, the studies proposed herein represent a modification to the USEPA suggested approach and will produce site-specific data for risk assessment purposes.

The purpose of this revised Technical Memorandum is to identify the proposed assessment and measurement endpoints for each of the sites of concern identified in the PERA as potentially harmful to site flora and/or fauna. A Detailed Ecological Risk Assessment (DERA) Work Plan specifying the additional ecological data to be gathered and the methods to be used to complete the detailed assessment of these sites is under development.

The assessment endpoints define the receptor species that should be monitored and protected because they may be adversely impacted by site-specific contamination. Measurement endpoints

are the tools used to evaluate the impacts on these receptors. Generalized assessment endpoints proposed for RI/FS sites at JPG include (1) supporting aquatic receptors, plant and soil fauna community composition and structure similar to that of an undisturbed community; (2) protecting raptors and carnivores from bioaccumulation of heavy metals due to exposure through their diet; (3) protecting small mammals from heavy metal poisoning due to exposure through their diet; and (4) protecting insectivorous birds from metal poisoning due to exposure through their diet. Site-specific and receptor-specific endpoints are presented in this document. Measurement endpoints identified for the JPG sites include one or more of the following:

- Macroinvertebrate sampling and fish counts in surface waters
- Rapid Bioassessment Protocol (RBP) for riparian habitat
- Laboratory plant toxicity testing using site soils
- *In-situ* earthworm toxicity testing using site soils
- Identification and relative abundance of soil microfauna
- Collection of soil samples for metals analysis, pH, and organic matter content to support soil toxicity testing
- Calculation of hazard indices (HIs) and hazard quotients (HQs) using Phase I, Phase II, and interim measures (IM) remediation confirmation sampling data

The key ecological receptors for which quantitative risk assessment calculations will be derived were also presented and accepted at the meeting held on August 14, 1997.

This document is intended to serve as a "Scientific Management Decision Endpoint" (SMDP), and as such, the conclusions agreed upon in this document will be the basis for future ecological work conducted at JPG.

1.0 INTRODUCTION

A revised Draft Preliminary Ecological Risk Assessment (PERA) has been completed for the Remedial Investigation/Feasibility Study (RI/FS) sites located South of the Firing Line at Jefferson Proving Ground (JPG) in Madison, Indiana. It was agreed during a site meeting on April 17, 1997 and follow-up conference calls on April 21 and 24, 1997 with representatives from the U.S. Environmental Protection Agency (USEPA), CH2M Hill (USEPA Contractor), U.S. Army Environmental Center (USAEC), U.S. Army Corps of Engineers (Louisville District), U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM), and Rust Environment & Infrastructure (Rust E&I) that Rust E&I could proceed with the Detailed Ecological Risk Assessment (DERA) prior to receiving formal comments on the PERA from the regulators. The first step in the DERA process was to develop site-specific assessment and measurement endpoints. To address this first step, Rust E&I issued a draft Technical Memorandum in June 1997 that presented the proposed endpoints for the RI/FS sites identified in the revised PERA as needing additional evaluation. Formal comments on the revised PERA were subsequently received by Rust E&I on July 17, 1997, and a meeting was held on August 14, 1997 to discuss these formal comments and the draft Technical Memorandum, and to serve as a scoping meeting for the DERA Work Plan. Minutes of the August 14, 1997 meeting are included as Appendix A of this document. Based on these meetings and discussions, this revised Technical Memorandum has been prepared to identify the assessment and measurement endpoints for each of the 24 sites (or combination of sites) for which additional information is needed in order to complete the risk assessment process. This document is intended to serve as a "Scientific Management Decision Endpoint" (SMDP) and as such, the conclusions agreed upon in this document will be the basis for future ecological work conducted at JPG.

2.0 SUMMARY OF THE PERA RESULTS

A total of 50 sites were initially identified for evaluation in the PERA. The PERA was based on data and information obtained primarily during the spring and summer of 1993 (Phase I). Based on the site analytical data, 72 COCs were selected for assessment in the PERA. Toxicity information was compiled for each COC and evaluated independently for both aquatic and terrestrial species. Data for aquatic species were compared to established surface water (USEPA Ambient Water Quality Criteria) and sediment criteria (Ontario Ministry of the Environment and National Oceanic and Atmospheric Administration guidelines), and data for terrestrial species were compared to site-specific soil background data. Site aquatic data that exceeded the published criteria were determined to present a potential risk to site aquatic life. For terrestrial (flora and fauna) species, potential receptor species were identified, and a toxicity assessment was then performed for all sites that had viable exposure pathways. For animal species, any site that had soil contaminant concentrations that exceeded the ratio of 0.01 for known toxic effects for a particular receptor species was considered to be potentially harmful to site wildlife. Risks to site flora were evaluated semi-quantitatively based on the available toxicity information. Based on these assessments, various inorganic compounds were determined to pose a potential risk to site flora and/or fauna at 24 of the 50 identified sites located south of the Firing Line. These sites and their associated COCs are presented in the following section.

3.0 SITE-SPECIFIC ASSESSMENT AND MEASUREMENT ENDPOINTS

Assessment endpoints are defined as "an explicit expression of the environmental value that is to be protected" (USEPA 1996). In more general terms, the assessment endpoints can be defined as potential receptors (flora or fauna) that could be adversely affected by contamination present at the site. These species must be monitored to determine if site contamination is impacting the ecological environment. The measurement endpoints are the tools used to evaluate the impacts on these receptors. As stated in the USEPA Ecological Risk Guidance for Superfund Document (USEPA 1996 and 1997), assessment endpoints are critical elements in the design of the ecological risk assessment and must be agreed upon as the focus of the risk assessment. Once assessment endpoints have been selected, testable hypotheses and measurement endpoints can be developed to determine whether or not a potential threat to the assessment endpoints exists. The selection of endpoints depends on the following:

- The COCs present and their concentrations
- Mechanisms of toxicity of the contaminants to different groups of organisms
- Presence of potential receptor groups that may be sensitive or highly exposed to the COCs and the attributes of the natural history of these receptors
- Potential complete exposure pathways

Site-specific assessment and measurement endpoints are discussed in the following subsections. Table 1 presents the sites and proposed actions for each site. Table 2 presents the detailed assessment and measurement endpoints for each site to be included in the DERA. Table 3 presents a summary of JPG sites and disposition with respect to the PERA, this Technical Memorandum, and the DERA. Table 4 provides the key ecological receptors for the DERA as presented at the August 1997 meeting with the regulators. Figure 1 shows the proposed 1997 field studies for the sites to be included in the DERA.

The proposed 1997 field studies include plant (phytotoxicity testing) and earthworm toxicity testing using site soils, soil fauna identification, and collection of soil samples for metals analysis, pH, and organic matter. In order to assist in the interpretation of the soil toxicity tests, three locations corresponding to areas where background soils were collected which correspond to the three main soil types (i.e., Rossmoyne, Avonburg, and Cobbsfork), will be included as reference locations. Fish counts, stream macroinvertebrate sampling, and Rapid Bioassessment Protocol will be conducted at Harbert's Creek and a reference stream segment.

Phytotoxicity tests can be used to verify the results of the risk assessment, as well as elucidate if physical disturbance or grazing rather than chemical contamination is responsible for observed changes in habitat structure. In addition, the phytotoxicity may possibly be used, if the data permit, to establish preliminary remedial goals (PRGs) on a chemical-by-chemical basis or on the basis of the metals mixture in the soils. To do this, five soil samples would be randomly collected at up to five on-site locations and the three background areas. This will provide an estimate of within and between location variability.

Five soil samples would be collected at random from within each of the on-site and background locations, and analyzed for metals content, organic matter, and pH by an analytical laboratory.

Two kilograms will be sent to a bioassay laboratory, where a bioassay with perennial rye grass will be conducted in the pure (0% dilution) soil samples. Five replicates from each soil sample will be used to obtain within sample variability. If phytotoxicity significantly greater than the background samples was observed in any given soil sample, a dilution series would be made with the appropriate background area soil as follows: 0%, 10%, 25%, 50%, 75%, 100%. The study design for the phytotoxicity tests is presented in Figure 1. The data will be used in the risk assessment to refute or support the results obtained by estimating site-related risk predicted by the HQs or HIs, as appropriate, in addition to providing estimates of PRGs.

3.1 SITE 1 - BUILDING 185 INCINERATOR

The only COC for this site is silver present in the site soils. It was found to be potentially harmful to site flora. The maximum detected silver concentration in soils was 35 milligrams per kilogram (mg/kg), which exceeds the recommended phytotoxic criteria (as published by the Ontario Ministry of the Environment) of 25 mg/kg for land used as parkland/residences. Only one other soil sample was collected from this site and analyzed for silver, showing a concentration of 14 mg/kg. In 1993 when the initial survey of the site was completed, the area immediately surrounding the incinerator was covered by a thick growth of grass and other perennial plants such as clover. One small area (approximately 10 square feet) located near the ash door of the building was observed to be devoid of vegetation. Today, much of the area surrounding this building has been plowed and planted in tobacco, and the bare area near the ash door is unnoticeable.

Since the suspected area of contamination is very small (approximately 0.2 acre) and the only COC is silver for flora, and because the natural area surrounding the site has been highly disturbed as a result of recent agricultural activities, it is recommended that no further ecological investigation be conducted at this site.

3.2 SITES 2 & 27 - SEWAGE TREATMENT AREA

The COCs (and maximum detected concentrations) for these sites are barium (500 mg/kg), lead (600 mg/kg), silver (210 mg/kg), and vanadium (77.5 mg/kg) in site soils; silver in the surface water (0.869 ug/L); and silver (17.0 mg/kg), arsenic (26.1 mg/kg), chromium (44.7 mg/kg), copper (21.7 mg/kg), iron (79,000 mg/kg), manganese (2,200 mg/kg), nickel (28.8 mg/kg), and zinc (185 mg/kg) in the sediments of Harbert's Creek. The soil concentrations of barium, lead, and vanadium were determined to be potentially harmful to animal species, and the levels of silver and lead in the soils were determined to be potentially harmful to plants. Site 2 is the outfall into Harbert's Creek; Site 27 is approximately 8.3 acres in size. In the spring of 1997, Site 27 was inadvertently plowed and planted in tobacco by the future site owner. Because of this disturbance, only the potential impacts to Harbert's Creek will be addressed in the DERA; hence, the site-specific assessment endpoint is:

- Survival, growth, and reproduction of fish, amphibians, and aquatic invertebrates.

Measurement endpoints will consist of the following:

- Calculation of HQs and HIs for fish in direct contact with surface water and sediment by using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated.
- Calculation of HQs and HIs for amphibians in direct contact with surface water and sediment using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated.
- Calculation of HQs and HIs for aquatic invertebrates in direct contact with surface water and sediment using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated.
- Fish counts and macroinvertebrate sampling of Harbert's Creek as compared to a nearby reference stream as an indication of water quality; and
- Rapid bioassessment protocol as an indication of riparian habitat quality.

3.3 SITES 3 & 4 - ABANDONED LANDFILL

The maximum detected concentrations of arsenic (20 mg/kg), barium (5,900 mg/kg), cadmium (12.40 mg/kg), copper (462 mg/kg), lead (1,300 mg/kg), and zinc (2,300 mg/kg) in site soils were determined to be potentially harmful to site flora and fauna. The area consists of an old field in the early stages of succession and is surrounded by a young forest dominated by black locust. Sites 3 and 4 are approximately 2.8 acres each in size and neither has been disturbed since the Phase I RI work was completed.

The following assessment endpoints were selected for these sites:

- Plant community composition and structure as habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations-herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level mammalian herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for these sites are:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;

- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;
- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval)
- Phase II (0-2 foot interval)
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.4 SITES 7 & 21B - RED LEAD DISPOSAL AREA AND TEMPORARY STORAGE AREA AT BUILDING 211

COCs (and maximum detected concentrations) for these sites are barium (800 mg/kg), cadmium (156 mg/kg), copper (215 mg/kg), and lead (13,000 mg/kg) in the site soils. Concentrations of cadmium and lead are potentially harmful to both flora and fauna, and the barium and copper concentrations were determined to be potentially harmful to fauna only (primarily small mammals). The area immediately surrounding Building 211 is frequently mowed grass; whereas farther out from the building, the area has been recently plowed and planted with soybeans. Site 7 is estimated to be less than 300 square feet while Site 21B is approximately 0.08 acre. These sites are currently in the interim remedial measures program, and most of the contaminated soils have been removed and the area backfilled with clean soil.

To determine if the interim measures conducted at these sites are adequate to protect ecological receptors, the assessment endpoints will be as follows:

- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores; and
- Survival, growth, and reproduction of terrestrial reptiles.

The measurement endpoints for these sites will be as follows:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores; and
- Calculation of HQs and HIs for soil invertebrates.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval) outside of the remediated area.
- IM confirmation sampling data

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.5 SITE 8 - SMALL ARMS FIRING RANGE

The only COC for this site (approximately 0.7 acre) is selenium, which was determined to be potentially harmful to site flora. The maximum detected concentration of selenium in the site soils was 7.8 mg/kg, which is only slightly above the criteria of 5.0 mg/kg set by the Ontario Ministry of the Environment for use as parkland/residences. The vegetation surrounding Building 295 consists primarily of grasses and weeds such as yarrow, clover, thistle, and dock. Since the only COC at this site is selenium, which indicates a potential risk to plants, and because the area of concern is restricted to isolated areas immediately adjacent to the building, no further ecological investigation is recommended for this site.

3.6 SITES 9 & 10 - BURNING GROUND SOUTH OF THE GATE 19 LANDFILL AND THE GATE 19 LANDFILL

The COCs for these sites (and the maximum detected concentrations) were as follows: arsenic (70 mg/kg), barium (6,000 mg/kg), mercury (1.70 mg/kg), nickel (157 mg/kg), vanadium (104 mg/kg), and zinc (363 mg/kg). Arsenic and mercury concentrations were determined to be both potentially phytotoxic and harmful to site fauna. Barium, nickel, vanadium, and zinc concentrations were determined to be potentially harmful to site fauna only. These sites are located in an area consisting primarily of unmowed grasses and forbs, and are surrounded by typical flatwoods in varying degrees of succession. Site 9 is estimated to be 4.6 acres in size, and Site 10 is approximately 15.4 acres. In 1996, Site 10 and the eastern portion of Site 9 were capped in accordance with current guidance for landfill closure. As a result of this action, the exposure pathways of ecological receptors to COCs at these sites have been effectively eliminated and no further ecological investigations are proposed for the capped area. The western portion of Site 9, which has not been capped, will be evaluated in the DERA as described in the following paragraphs.

The following assessment endpoints were selected for the uncapped portion of Site 9:

- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for this site are:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;
- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval)
- Phase II (0-2 foot interval)
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.7 SITE 11 - BURNING AREA FOR EXPLOSIVE RESIDUE

The only COC for this site (approximately 1.6 acres) is lead, which was detected at a maximum concentration of 790 mg/kg. This concentration was determined to be potentially harmful to both site flora and fauna. The site is located in an open field of infrequently mowed grassland. Early to mid-successional flatwoods surround the site in all four directions. This site is scheduled to be remediated as part of a Resource Conservation and Recovery Act (RCRA) closure process under the direction of Halliburton NUS.

The following assessment endpoints were selected for this site:

- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for this site are:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;

- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval) outside of the remediated area
- RCRA closure plan sampling data, if available
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.8 SITE 13 - OLD FIRE TRAINING PIT

The COCs (and the maximum detected concentrations) for this site (estimated to be less than 0.1 acre) were as follows: arsenic (19 mg/kg), barium (711 mg/kg), cadmium (5.34 mg/kg), and zinc (5,800 mg/kg). The zinc concentrations were determined to be both potentially harmful to both site flora and fauna, whereas the concentrations of arsenic and barium were determined to be potentially harmful to site fauna, and the concentrations of cadmium were determined to be potentially phytotoxic. This site is in an open field of infrequently mowed/burned grassland adjacent to the airport runways. There is a developing wetland in the pit, which is currently dominated by cattails.

Since the site is small, and the exceedances were slight and based on maximum detected values instead of average concentrations, it is not expected that flora or fauna populations would be impacted by the levels detected in the site soils. In addition, since the surrounding area incorporates airport runways, no further ecological investigation is recommended for this site.

3.9 SITE 14 - YELLOW SULFUR DISPOSAL AREA

For this site (estimated to be 0.11 acre), the maximum detected concentrations of arsenic (110 mg/kg), barium (326 mg/kg), copper (807 mg/kg), nickel (146 mg/kg), lead (16,000 mg/kg), and zinc (11,000 mg/kg) in the site soils were determined to be potentially harmful to site fauna; and the maximum detected concentrations of arsenic (110 mg/kg), cadmium (4.44 mg/kg), chromium (1,300 mg/kg), copper (807 mg/kg), molybdenum (51.9 mg/kg), lead (16,000 mg/kg), and zinc (11,000 mg/kg) in the site soils were all determined to be potentially phytotoxic. This site has been partially remediated with most of the contaminated soils having been removed; however, the remediated area has not been backfilled with clean soil. The site is surrounded by young flatwoods that are located approximately 20 feet south of a small wetland area located along an intermittent drainage.

The following assessment endpoints were selected for this site:

- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for this site are:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;
- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval) outside of the remediated area
- IM confirmation sampling data
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.10 SITE 15 - BURN AREA SOUTH OF NEW INCINERATOR

The COCs for this site (and the maximum detected concentration) were barium (6,700 mg/kg), cadmium (5.95 mg/kg), copper (75,000 mg/kg), lead (23,000 mg/kg), antimony (211 mg/kg),

selenium (2.35 mg/kg), and zinc (38,000 mg/kg) in the site soils. The copper, lead, and zinc concentrations were determined to be both harmful to site flora and fauna; whereas the concentrations of barium, antimony, and selenium were determined to be potentially harmful to site fauna only. The site has been remediated and the area backfilled with clean soil. The area surrounding this site is mostly grass covered, and there are woods along the south side of an intermittent drainage that is approximately 100 feet from the site. This site is estimated to be less than 0.1 acre and is adjacent to Site 14.

Since this site is adjacent to Site 14, the assessment and measurement endpoints proposed for Site 14 are also considered to be applicable to this site. Therefore, Sites 14 and 15 will be combined for the purposes of the DERA, and the same assessment and measurement endpoints will apply to both sites.

3.11 SITE 25 - PAPERMILL ROAD DISPOSAL AREA

The COCs for this site (and the maximum detected concentrations) are arsenic (47 mg/kg), barium (293 mg/kg), thallium (44.70 mg/kg), and vanadium (95 mg/kg) in the site soils. The elevated arsenic concentration appears to be a localized "hotspot" since it is the only sample of 12 total samples collected from the site that exceeded the 25 mg/kg criteria for phytotoxic effects as set by the Ontario Ministry of the Environment. The average arsenic concentration at the site is 8.3 mg/kg. The elevated concentrations of barium, thallium, and vanadium were determined to be potentially harmful to site fauna only. This site (approximately 0.9 acre) is surrounded by frequently mowed grassland with pea-gravel, asphalt, and clinkers present throughout most of the site. Part of the site was inadvertently plowed and planted with corn; however, the site has since been fenced and no further disturbance has occurred. The site is scheduled to have interim remedial measures conducted in September of 1997.

The following assessment endpoints were selected for this site:

- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for this site are:

- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;

- Calculation of HQs and HIs for raptors;
- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;
- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval) outside of the remediated area
- Phase II (0-2 foot interval) outside of the remediated area
- IM confirmation sampling data
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.12 SITE 26 - DRMO STORAGE AREA

The COCs for this site (and maximum detected levels) are barium (1,800 mg/kg), copper (12,000 mg/kg), lead (40,000 mg/kg), and zinc (8,100 mg/kg) in the site soils. The copper, lead, and zinc concentrations were all determined to be potentially harmful to both site flora and fauna, whereas the barium concentration was determined to be potentially harmful to site fauna only. Site 26 is approximately 0.2 acre including both the small, isolated area in the middle of the plowed field and the fenced area formerly used as a staging area. The isolated area in the field had been inadvertently plowed and subsequently was remediated as part of the interim measures program and backfilled with clean soils in 1997.

Since the fenced area is mostly paved or consists of crushed gravel/asphalt, the potential exposure pathways for ecological receptors are essentially non-existent. Additionally, since the isolated area in the field is so small (less than 500 square feet) and the surrounding area has been significantly altered as a result of agricultural practices being conducted near this site; no further ecological evaluations are recommended for this site.

3.13 SITES 28, 29, AND 39 - GATOR Z AREA

The cadmium concentrations in both the surface water and sediments of the small pit in this area exceeded the screening criteria and, therefore, were determined to pose a potential risk to site

aquatic life. The soil COCs (and maximum detected concentration) are cadmium (35.3 mg/kg), copper (18,000 mg/kg), and zinc (613 mg/kg). The copper concentrations were determined to be potentially harmful to both site flora and fauna, whereas the cadmium concentration was determined to be potentially phytotoxic. The zinc concentration was determined to be potentially harmful to site fauna. The area surrounding the mine test pits (Site 39) is covered with grass and gravel and is bordered by flatwoods to the east, south, and west. The open burn site (Site 28) and mine scrap disposal site (Site 29) are in an area north of the mine test pit area, which is slowly being reforested by natural succession. Site 28 is approximately 0.2 acres, and Site 29 is estimated to be less than 0.5 acres. Site 39 is almost 16 acres.

Sites 28 and 29 are in the interim measures program, and most of the contaminated soils have been removed. However, due to concerns regarding unexploded ordnance (UXO) at these sites, interim remedial measures have been halted until the area has been cleared of UXO. Therefore, the following assessment and measurement endpoints are for Site 39, and are assumed to be applicable to Sites 28 and 29 as well.

The following assessment endpoints were selected for these sites:

- Survival, growth, and reproduction of fish, amphibians, and aquatic invertebrates (Site 29 only).
- Plant community composition and habitat value to mammalian, avian, and reptilian species;
- Survival, growth, and reproduction of avian species;
- Survival, growth, and reproduction of small mammal populations—herbivore/insectivore;
- Survival, growth, and reproduction of upper trophic level avian raptors;
- Survival, growth, and reproduction of upper trophic level mammalian carnivores;
- Survival, growth, and reproduction of upper trophic level mammalian omnivores;
- Survival, growth, and reproduction of upper trophic level mammalian insectivores;
- Survival, growth, and reproduction of upper trophic level herbivores;
- Survival, growth, and reproduction of terrestrial reptiles; and
- Soil invertebrate community structure and composition functional value to the ecosystem.

The measurement endpoints for these sites are:

- Calculation of HQs and HIs for fish in direct contact with surface water and sediment by using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated (Site 29 only).
- Calculation of HQs and HIs for amphibians in direct contact with surface water and sediment using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated (Site 29 only).
- Calculation of HQs and HIs for aquatic invertebrates in direct contact with surface water and sediment using site-specific surface water and sediment data; where appropriate, both Phase I and Phase II data will be evaluated (Site 29 only).
- Calculation of HQs and HIs for plants;
- Calculation of HQs and HIs for avian species;
- Calculation of HQs and HIs for small mammal species;
- Calculation of HQs and HIs for raptors;

- Calculation of HQs and HIs for medium-size carnivores;
- Calculation of HQs and HIs for medium-size omnivores;
- Calculation of HQs and HIs for mammalian insectivores;
- Calculation of HQs and HIs for medium-size herbivores;
- Calculation of HQs and HIs for soil invertebrates;
- Collection of soil samples for metals analysis, pH, and organic matter to support toxicity testing;
- Plant toxicity testing on site soils and reference locations;
- In-situ earthworm toxicity testing on site soils and reference locations; and
- Quantitative soil fauna identification on site soils and reference location soils.

The calculated HQs and HIs will use the upper 95% confidence interval for the following surface soil data sets:

- Phase I (0-2 foot interval) outside of the remediated area
- Phase II (0-2 foot interval) outside of the remediated area
- IM confirmation sampling data
- Surface soil metals data collected in support of the proposed toxicity tests

An area use factor for each receptor species and other site specific information will also be used, as applicable.

3.14 SITE 31 - BUILDING 227 FORMER STORAGE PAD

The only COC at this site is barium, which was detected at a maximum concentration of 742 mg/kg in the site soils. This concentration was determined to be potentially harmful to site fauna. The site is surrounded by a frequently mowed lawn consisting of typical lawn grasses such as fescue, rye, and bluegrass. Since barium does not bioaccumulate and the impacted area is small (less than 150 square feet), no further ecological investigation is recommended for this site.

3.15 SITE 34 - BUILDING 136 SANDBLASTING AREA

The only COC at this site is lead, which was detected at a maximum concentration of 330 mg/kg in the site soils. This concentration was determined to be potentially harmful to site fauna; however, the next highest detection of lead in the site soils was 62 mg/kg. Building 136 is surrounded by pavement and frequently mowed grass. Since there is only one COC and the impacted area is small (estimated to be less than 0.1 acre), no further ecological investigation is recommended for this site.

3.16 SITE 46 - OLD FLARE TEST SITES AT SOUTH END OF THE AIRPORT

There are no sampling data available for this site; therefore, it was identified as a data gap in the PERA and sampling of the site was included as a recommendation for the DERA. To fill in this identified data gap, soil sampling may be conducted to determine the nature and extent of contamination, if any, at this site. Once the sampling data have been collected and verified, this site will be evaluated as to its potential risk to site ecological receptors. Because the scheduling of this additional data collection is uncertain at this time, this site will be addressed in a separate technical memorandum after completion of the fieldwork. It is expected that the soil sampling data will be screened against background data, and preliminary HQs and HIs will be calculated for selected receptor species. If this preliminary screening shows a potential risk to the site ecology, the possibility of conducting additional studies will be evaluated at that time.

3.17 SITE 47 - POSSIBLE TEST AREAS - WOODED AREA SOUTH OF AIRPORT

As with Site 46, there are no sampling data available for this site; therefore it was identified as a data gap in the PERA and sampling of the site was included as a recommendation for the DERA. To fill in this identified data gap, soil sampling may be conducted to determine the nature and extent of contamination, if any, at this site. Once the sampling data have been collected and verified, this site will be evaluated as to its potential risk to site ecological receptors. Because the scheduling of this additional data collection is uncertain at this time, this site will be addressed in a separate technical memorandum after completion of the fieldwork. It is expected that the soil sampling data will be screened against background data, and preliminary HQs and HIs will be calculated for selected receptor species. If this preliminary screening shows a potential risk to the site ecology, the possibility of conducting additional studies will be evaluated at that time.

3.18 SITE 49 - POSSIBLE EXPLOSIVE ORDNANCE SOUTH OF FIRING LINE

As with Sites 46 and 47, there are no sampling data available for this site; therefore, it was identified as a data gap in the PERA, and sampling of the site was included as a recommendation for the DERA. To fill in this identified data gap, soil sampling may be conducted to determine the nature and extent of contamination, if any, at this site. Once the sampling data have been collected and verified, this site will be evaluated as to its potential risk to site ecological receptors. Because the scheduling of this additional data collection is uncertain at this time, this site will be addressed in a separate technical memorandum after completion of the fieldwork. It is expected that the soil sampling data will be screened against background data, and preliminary HQs and HIs will be calculated for selected receptor species. If this preliminary screening shows a potential risk to the site ecology, the possibility of conducting additional studies will be evaluated at that time.

4.0 SUMMARY

This document is intended to serve as a "Scientific Management Decision Endpoint" (SMDP), and as such, the conclusions agreed upon in this document, will be the basis for future ecological work conducted at JPG. The purpose of this technical memorandum is to identify assessment and measurement endpoints for each of the sites of concern that were identified in the PERA as being potentially harmful to site flora and/or fauna. For each identified site, assessment and measurement endpoints have been specified, and should be reviewed as to their appropriateness and relevancy in order to proceed with the JPG ecological risk assessment. A detailed work plan will be developed specifying the methods that will be used to obtain additional data needed to complete the DERA for these sites when the proposed assessment and measurement endpoints for each site are approved.

Table 1. Proposed Action for DERA Sites for Jefferson Proving Ground

SITE NO.	SITE NAME	PROPOSED ACTION FOR DERA
1	Building 185 Incinerator	No further ecological evaluation
2 & 27	Sewage Treatment Plant Area	Fish counts, stream macroinvertebrate sampling, Rapid Bioassessment of Harbert's Creek and comparison to a nearby reference stream segment Calculation of HQs ^(a) and HIs ^(b) for aquatic receptors
3 & 4	Explosive Burn Area and Abandoned Landfill	1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna
7 & 21B	Red Lead Disposal Area and Temporary Storage Area at Building 211	Calculation of HQs and HIs for terrestrial receptors using the confirmation sampling data from the interim measures program.
8	Small Arms Firing Range	No further ecological evaluation
9 & 10	Burning Ground South of Gate 19 Landfill & Gate 19 Landfill	No further ecological evaluation for Site 10 (under landfill cap) For Site 9 (area not capped): 1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna
11	Burning Area for Explosive Residue	1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna
13	Old Fire Training Pit	No further ecological evaluation
14 & 15	Yellow Sulfur Area and Burn Area South of New Incinerator	1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna

Table 1. Proposed Action for DERA Sites for Jefferson Proving Ground (continued)

SITE NO.	SITE NAME	PROPOSED ACTION FOR DERA
25	Papermill Road Disposal Area	1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna
26	DRMO Storage Area	No further ecological evaluation
39 (Intended to address Sites 28/29 as well)	Gator Z Area	1) Plant toxicity testing 2) In-situ earthworm toxicity testing 3) Identification of soil microfauna 4) Collection of soil samples for metals analysis, pH, and organic matter 5) Calculation of HQs and HIs for terrestrial receptors, plants, soil fauna; calculation of HQs and HIs for aquatic receptors (Site 29 only)
31	Building 227 Former Storage Pad	No further ecological evaluation
34	Building 136 Sandblasting Area	No further ecological evaluation
46	Old Flare Test Sites at Airport	Identified as a data gap- possible future sampling
47	Possible Test Areas	Identified as a data gap - possible future sampling
49	Possible Explosive Ordnance	Identified as a data gap-possible future sampling

^aHazard quotients.

^bHazard indices.

Table 2. JPG Assessment and Measurement Endpoints

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth, and reproduction of fish (e.g., creek chub), amphibians (e.g., Pickerel frog), and aquatic invertebrates (e.g., crayfish)	<p>Sites 2/27 - Sewage Treatment Plant (STP)/Sewage Sludge Application Areas, and STP outfall to Harbert's Creek</p> <p>Site 29 - Note: HQs and HIs will be calculated as measures of exposure; however, no field studies will be conducted at Site 29.</p>	<ul style="list-style-type: none"> Calculation of I/Qs and HIs for fish in direct contact with surface water and sediment by using site-specific surface water and sediment data Calculation of I/Qs and HIs for amphibians in direct contact with surface water and sediment using site-specific surface water and sediment data Calculation of I/Qs and HIs for aquatic invertebrates in direct contact with surface water and sediment using site-specific surface water and sediment data 	<ul style="list-style-type: none"> Fish surveys Sampling of macroinvertebrate populations for species and abundance in the stream segment, adjacent to Sewage Treatment Plant and in a nearby unimpacted stream segment as an indication of water quality Rapid bioassessment protocol as an indication of riparian habitat quality
Plant community composition and habitat value to mammalian, avian and reptilian species	<p>Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location.</p>	<ul style="list-style-type: none"> Calculation of I/Qs and HIs for plant species in direct contact with soil, sediment and surface water using site-specific soil, sediment and surface water data Calculation of I/Qs and HIs for plant species for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the direct soil contact pathway. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth, and reproduction of avian species- granivore, omnivore, insectivore, and wading birds (e.g., mourning dove, wild turkey, chimney swift, great blue heron)	Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39 Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location	<ul style="list-style-type: none"> Calculation of HQs and HIs for avian species: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for avian species for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. *JPG Assessment and Measurement Endpoints (continued)*

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of small mammal populations - herbivore-insectivore (e.g., white-footed mouse)	<p>Sites 3/4, 7&21b, 9, 11,14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location</p>	<ul style="list-style-type: none"> Calculation of HQs and HIs for small mammal species: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for small mammals for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of upper trophic level avian raptors (e.g., American kestrel)	<p>Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21; however, no field studies will be conducted at that location</p>	<ul style="list-style-type: none"> Calculation of HQs and HIs for raptors: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for raptors for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of upper trophic level mammalian carnivores (e.g., red fox)	<p>Sites 3/4, 7&21b, 9, 11,14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location</p>	<ul style="list-style-type: none"> Calculation of HQs and HIs for medium-size carnivores: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for mammalian carnivores for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of upper trophic level mammalian omnivores (e.g., raccoon)	<p>Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location</p>	<ul style="list-style-type: none"> Calculation of HQs and HIs for medium-size omnivores: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for mammalian omnivores for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of upper trophic level mammalian insectivore (e.g., little brown myotis)	Sites 3/4, 9, 11, 14/15, 25, 28/29/39 Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location	<ul style="list-style-type: none"> Calculation of HQs and HIs for mammalian insectivores: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting food using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for mammalian insectivores for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Survival, growth and reproduction of upper trophic level mammalian herbivores (e.g., eastern cottontail rabbit)	Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28 29/39 Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location	<ul style="list-style-type: none"> Calculation of HQs and HIs for medium-size herbivores: <ul style="list-style-type: none"> ingesting surface water using site-specific surface water data ingesting diet using literature-derived BAFs and site-specific soil and sediment data to predict dietary COPC concentrations in individual receptor ingesting soil using site-specific soil and sediment data dermal contact with soil using site-specific soil data Calculation of HQs and HIs for mammalian herbivores for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the soil ingestion/dermal contact pathways. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)
Survival, growth and reproduction of terrestrial reptiles (e.g., eastern box turtle)	Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39 Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location	It is assumed that evaluation of HQs and HIs for avian species will be protective of reptiles.	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 2. JPG Assessment and Measurement Endpoints (continued)

Assessment Endpoint	Applicable JPG Sites	Measures of Exposure	Measures of Effects
Soil invertebrate community structure and composition functional value to ecosystem	<p>Sites 3/4, 7&21b, 9, 11, 14/15, 25, 28/29/39</p> <p>Note: Endpoints apply to Sites 7/21b; however, no field studies will be conducted at that location</p>	<ul style="list-style-type: none"> Calculation of HQs and HIs for soil invertebrates: <ul style="list-style-type: none"> based on direct soil contact based on direct surface water contact Calculation of HQs and HIs for soil fauna for metals in soil obtained from 5 sampling locations (1997). These data will be used in conjunction with historic data to evaluate the direct soil contact pathway. These additional data may be used to calculate site-specific PRGs. 	<ul style="list-style-type: none"> Plant toxicity testing on site soils and reference location by soil type (5 samples) In-situ earthworm toxicity testing on site soils and reference location by soil type (5 samples) Quantitative soil fauna identification on site soils and reference location by soil type (5 samples)

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA

Site(s) No.	Site Name	Part of PERA ^(b) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
1	Bldg. 185 Incinerator	YES	Carried Forward	Small area - no further eco action	0.2 acres	YES	NO	N/A ^(b)	
2/27	Sewage Treatment Area	YES	Carried Forward	Multiple COCs ^(b) and multiple exposure pathways	520 sq. ft. and 8.3 acres	YES	YES	Phase I and II	See Tables 1 and 2 for proposed field studies and data evaluation
3/4	Explosive Burn Area/Abandoned Landfill	YES	Carried Forward	COCs have potential to bioaccumulate	2.8 acres each	NO	YES	Phase I and Phase II	See Tables 1 and 2 for proposed field studies and data evaluation
5/6	Wood-Storage Pile/ Wood-Burning Area	YES	0.01 ratio was not exceeded	N/A	N/A	NO	NO	N/A	
7/21B	Red Lead Disposal Area/Temporary Storage Area at Bldg. 211	YES	Carried Forward	Rescreen with IM ^(b) data; determine if the residual levels of the COCs are protective of site fauna; calculate risk on Phase I data outside remediation boundaries, if applicable	300 sq. ft./0.08 acres	NO	YES	Phase I and IM data confirmation	See Tables 1 and 2 for proposed field studies and data evaluation
8	Small Arms Firing Range	YES	Carried Forward	Area of concern restricted to isolated areas adjacent to building (no pathway)	0.7 acres	NO	NO	N/A	
9/10	Burning Ground South of Gate 19 Landfill/Gate 19 Landfill	YES	Carried Forward	COCs have the potential to bioaccumulate through incidental soil ingestion Calculate risk on Phase I and Phase II data outside of landfill cap (Site 9 only)	4.6 acres/15.4 acres	NO	YES	Phase I and Phase II	See Tables 1 and 2 for proposed field studies and data evaluation Gate 19 Landfill (Site 10) has been Capped
11	Burning Area for Explosive Residue	YES	Carried Forward	Residual levels of the COC (lead) in soils Calculate risk on Phase I data	1.6 acres	NO	YES	Phase I data	See Tables 1 and 2 for proposed field studies and data evaluation

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA (continued)

Site(s) No.	Site Name	Part of PERA ^(b) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
12a, 24, 35	Bldg. 602 Solvent Pit/ Bldg. 602 Soil Staging Area/ Former Leaking UST ^(c)	YES	0.01 ratio was not exceeded for any organic compounds; compounds exceeding the 0.01 ratio are considered to be essentially non- toxic to most animals	N/A	N/A	NO	NO	N/A	
12b	Bldg. 617 Solvent Pit	YES	0.01 ratio was not exceeded for any organic compounds; compounds exceeding the 0.01 ratio are considered to be essentially non- toxic to most animals	N/A	N/A	NO	NO	N/A	
12c, 20a	BLDG. 279 Solvent Pit/Temporary Waste Storage Area	YES	0.01 ratio was not exceeded for any organic compounds; compounds exceeding the 0.01 ratio are considered to be essentially non- toxic to most animals	N/A	N/A	NO	NO	N/A	
13	Old Fire Training Pit	YES	Carried Forward	Site is small and exceedances are slight and based on Maximum Detection Values instead of average concentrations	<0.1 acre	NO	NO	Phase I and Phase II	

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA (continued)

Site(s) No.	Site Name	Part of PERA ^(b) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
14	Yellow Sulfur Disposal Area	YES	Carried Forward	Rescreen with IM data; determine if the residual levels of the COCs are protective of site fauna; calculate risk on Phase I data outside remediation boundaries, if applicable	0.11 acre	NO	YES	Phase I and IM confirmation data	See Tables 1 and 2 for proposed field studies and data evaluation
15	Burn Area South of the New Incinerator	YES	Carried Forward	Rescreen with IM data; determine if the residual levels of the COCs are protective of site fauna; calculate risk on Phase I data outside remediation boundaries, if applicable	0.1 acre	NO	YES	Phase I and IM confirmation data	See Tables 1 and 2 for proposed field studies and data evaluation
16	Potential Ammo Dump Site	No contamination found	N/A	N/A	N/A	NO	NO	NONE	
17	Asbestos-Containing Materials	Inside of buildings	N/A	N/A	N/A	NO	NO	N/A	
18	Underground Storage Tanks	No ecological habitat	N/A	N/A	N/A	NO	NO	N/A	
19	Off-Site Water Supply Wells	No contamination found	N/A	N/A	N/A	NO	NO	Phase I	
20b	Temporary Waste Storage at Building 305	YES	0.01 ratio was not exceeded for any organic compounds, compounds exceeding the 0.01 ratio are considered to be essentially non- toxic to most animals	N/A	25 ft. X 30 ft.	NO	NO	Phase I	
21a/30	Temporary Storage Area at Building 204	YES	0.01 ratio was not exceeded	N/A		NO	NO	Phase I	

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA (continued)

Site(s) No.	Site Name	Part of PERA ^(a) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
22/23	Building 216 Locomotive Maintenance Pit/Potential Solvent Disposal Pit	No contamination found	N/A	N/A		NO	NO	Phase I	
25	Papermill Road Disposal Area	YES	Carried Forward	COCs potentially harmful to site fauna, small mammals potential heavy metal poisoning through diet Calculate risk using both Phase I and Phase II data as applicable	0.9 acres	NO (see comment)	YES	Phase I, Phase II, and IM confirmation data	See Tables 1 and 2 for proposed field studies and data evaluation Plowed area extends partially into the eastern boundary
26	DRMO Storage Area	YES	Carried Forward	Due to small site, no further evaluation is recommended in TN ^(c)	0.2	NO	NO	IM confirmation data available	No further ecological evaluation will take place
28/29/39	Gator Z Area Open Burn Area/ Scrap Mine Disposal Area/ Mine Test Area	YES	Carried Forward	Rescreen with IM data; determine if the residual levels of the COCs are protective of site fauna; calculate risk on both Phase I and Phase II data outside remediation boundaries, if applicable Potential risk to site aquatic life, COCs potentially harmful to site flora and fauna	0.2/<0.5/ 16 acres	NO	YES	Phase I (Sites 28 and 29), Phase I and Phase II (Site 39 only) IM confirmation data (Sites 28 & 29)	See Tables 1 and 2 for proposed field studies and data evaluation
31	Building 227 Former Storage Pad	YES	Carried Forward	Barium is not expected to bioaccumulate and impacted area is small	<150 sq. ft	NO	NO	Phase I	
32	Building 105 Locomotive Maintenance Pit/ Former Lead Soldering Area	No contamination found	N/A	N/A	N/A	NO	NO	Phase I, one wipe sample, no results listed in RI	

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA (continued)

Site(s) No.	Site Name	Part of PERA ^(a) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
33	Building 333 New Incinerator	YES	Compounds exceeding the 0.01 ratio are considered to be essentially non-toxic to most animals	N/A	N/A	NO	NO	Phase I	
34	Building 136 Sandblasting Area	YES	Carried Forward	Impacted area is small and with Pb being the only COC no further ecological investigation is recommended	<0.1 acre	NO	NO	Phase I	
36	NO. 2 Oil Spill at Building 103	YES	TPH only contaminant. Toxicity values unavailable	N/A	N/A	NO	NO	Phase I	
37	Gasoline Station Building 118	No contamination found	N/A	N/A	N/A	NO	NO	Phase I GW samples	
38/45	NW-SE Runway Flare Test Area/ Possible UXO at the Airport	(38) YES (45) No contamination found	Site 38 compounds exceeding the 0.01 ratio are considered to be essentially non-toxic to most animals	N/A	N/A	NO	NO	Phase I	
40	Discharge/Fill Pipe at Building 259	Remediated	N/A	N/A	N/A	NO	NO	Phase I	
41	Building 281 Fuel Oil From Former UST	Remediated	N/A	N/A	N/A	NO	NO	Phase I	
42	Building 281 Indoor Range	Inside of building	N/A	N/A	N/A	NO	NO	Phase I	
43	Possible USTs or Wells at Artillery and Infantry Roads	No contamination found	N/A	N/A	N/A	NO	NO	None	

Table 3. Summary of JPG Sites and Disposition Based on PERA, Technical Memorandum, and DERA (continued)

Site(s) No.	Site Name	Part of PERA ^(a) ?	Eliminated/ Carried Forward	Technical Memorandum (September 1997)	Size	Plowed	Include in DERA ^(b) ?	Data Available	Comments
44	Underground Concrete Vault Near Airport Rail Tracks	No contamination found	N/A	N/A	N/A	NO	NO	Phase I	
46	Old Flare Test Sites at South End of the Airport	Potential data gap	N/A	N/A	N/A	NO	YES	None	
47	Possible Test Areas - Wooded Area South of Airport	Potential data gap	N/A	N/A	N/A	NO	YES	None	
48	Ammunition Storage Igloos South of the Firing Line	No contamination found	N/A	N/A	N/A	NO	NO	None	
49	Possible Explosive Ordnance South of Firing Line	Potential data gap	N/A	N/A	N/A	NO	YES	None	
50	Building 186 Wash Rack and Oil/Water Separator	No contamination found	N/A	N/A	N/A	NO	NO	None	

^aPreliminary Ecological Risk Assessment.

^bDetailed Ecological Risk Assessment.

^cNot applicable.

^dContaminants of concern.

^eInterim Measures.

^fUnderground storage tanks.

^gTechnical Memorandum.

Table 4. JPG Key Receptors

Common Name	Class	Scientific Name - Genus and Species	Category	Examples of Other JPG Wildlife and Vegetation Represented by Key Receptor
Red fox	Mammalia	<i>Vulpes vulpes</i>	Carnivore	Coyotes
Eastern cottontail	Mammalia	<i>Sylvilagus floridanus</i>	Herbivore	Deer
White-footed mouse	Mammalia	<i>Peromyscus leucopus</i>	Herbivore, insectivore	Shrews, voles
Mourning dove	Aves	<i>Zenaida macroura</i>	Granivore	Avian granivores
Chimney swift	Aves	<i>Chaetura pelagica</i>	Insectivore	Avian insectivores
Wild turkey	Aves	<i>Meleagris gallopavo</i>	Omnivore	Omnivorous upland game birds
American kestrel	Aves	<i>Falco sparverius</i>	Carnivore, insectivore	Raptors
Crayfish	Crustacea	<i>Cambarus diogenes</i>	Omnivore, detritivore	Terrestrial invertebrates
Little brown myotis	Mammalia	<i>Myotis lucifugus</i>	Insectivore	Mammalian insectivore
Plants	----	-----	Terrestrial vegetation	All vegetation
Crayfish	Crustacea	<i>Cambarus rusticus</i>	Omnivore, detritivore	Aquatic and benthic invertebrates
Creek chub	Pisces	<i>Semotilus atromaculatus atromaculatus</i>	Fish	All fish
Pickereel frog	Amphibia	<i>Rana palustris</i>	Insectivore	Amphibians
Great blue heron	Aves	<i>Ardea herodias</i>	Carnivore, insectivore	Omnivorous wading birds
Raccoon	Mammalia	<i>Procyon lotor</i>	Omnivore	Badger, skunk

Proposed Terrestrial Field Studies for the DERA

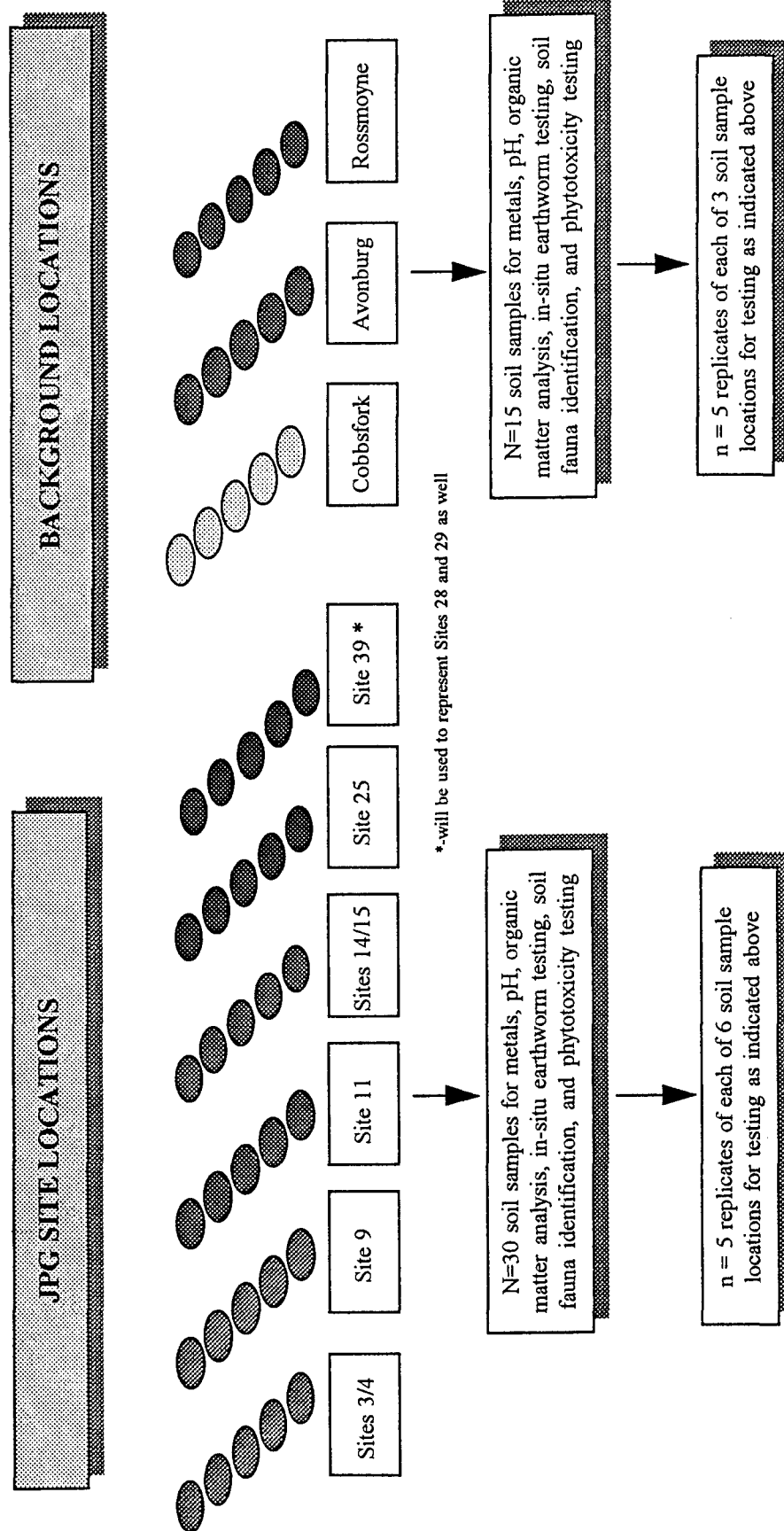


Figure 1. Proposed Terrestrial Field Studies for the DERA

5.0 REFERENCES

- Rust Environment and Infrastructure (Rust E&I), 1994. *Jefferson Proving Ground South of the Firing Line Final Draft Remedial Investigation* ; Prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD.
- Rust E&I, 1997. *Revised Final Draft Remedial Investigation, Section 47, Preliminary Ecological Risk Assessment for Jefferson Proving Ground, Madison, Indiana.*; Prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD.
- USEPA, 1996. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Internal Review Draft*, 6/3/96.
- USEPA, 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*, 6/5/97.

APPENDIX A

**JEFFERSON PROVING GROUND
DERA WORK PLAN PRESENTATION
AUGUST 14, 1997 MINUTES**

In attendance:

<u>Name</u>	<u>Organization</u>
Karen Mason-Smith	USEPA (CERCLA)
Brenda Jones	USEPA (CERCLA)
Joe Sandrin	CH2M Hill (USEPA contractor)
Jack Dingledine	CH2M Hill
Brooks Evens	U.S. Army Corps of Engineers (USACE)
John Manley	IDEM
Matt McAtee	U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM)
Matthew Bazar	USACHPPM
Celeste Marsh	Rust Environment & Infrastructure (Rust E&I) (USAEC contractor)
Karen Fields	Rust E&I
Carolyn Fordham	Terra Technologies (Rust E&I contractor)

Attendees arrived at the meeting room at approximately 9:00 AM. Karen Mason-Smith made copies of hand-out materials and John Manley distributed copies of the IDEM's comments on the Technical Memorandum to the Army and Rust E&I. The meeting began at approximately 9:30 AM with introductions made by Karen Mason-Smith. Celeste Marsh was to start her presentation about the work plan; however, Brenda Jones recommended skipping the slides associated with the approach for conducting an ERA. Ms. Jones indicated that the work plan should cite and follow the Superfund guidance issued June 1997, specifically the 8 steps identified in that document as well as identify the "Scientific Management Decision Points (SMDPs). Ms. Jones indicated that the Federal Register (9/96) addressed the ERA process on a more general basis. Ms. Marsh agreed to revise the DERA work plan accordingly; however, both she and Carolyn Fordham noted that the differences between the two documents were not major in content nor in interpretation.

Brenda Jones subsequently stated that the proposed small mammal trap and release, and the vegetation transects would not be appropriate as measures of effects since these types of studies require more than one year of data collection, typically 7 years. Ms. Jones further stated that using population studies to characterize habitats was fine; however, they were not appropriate as a measures of effect by themselves. Ms. Jones stated that using only 1 year's worth of data would not allow the risk assessors to get a handle on the natural variability of the populations, and furthermore, the sizes of many of the sites of concern were too small for inferring population level effects. Carolyn Fordham then stated that the population study data would be used to supplement HI calculations that

would also be done at the study sites, and the population data would be used to evaluate key receptor species. Ms. Jones responded that the presence of a receptor species at a site does not mean that the site is not a problem - these were the kind of inferences that should not be made. Ms. Jones then stated that she thought the proposed aquatic sampling (macroinvertebrate and fish) would be appropriate methods to evaluate impacts at Site 2 (Sewage Treatment Plant outflow at Harbert's Creek). Ms. Jones then stated that what they (i.e., the USEPA) are looking for are multiple lines of evidence, and she thought toxicity testing was a better way to measure site-specific effects. Ms. Jones stated that she thought a population census was limited in its value to really tell anything specific about a site. John Manley agreed with Ms. Jones, and further stated that IDEM's ecologist, Jim Smith, thought that the money proposed for population studies could be spent better elsewhere. Ms. Jones then pointed out that the agencies (USEPA & IDEM) had made these same comments on the March 1996 draft DERA work plan over 1 1/2 years ago regarding the adequacy of population studies and the inferences which could be made from them. Upon further discussion, the USEPA stated that population studies could be used to characterize a habitat, but the data could not be used as the basis for risk management decisions. Following a short break from 10:25 AM to 10:35 AM, Ms. Marsh proposed to eliminate the collection of the small mammal and vegetation data; however, the rapid bioassessment and fish counts of Harbert's Creek and a reference stream segment would still be conducted.

Brenda Jones went on record to say that she felt that the surveys would provide valuable data for site characterization; however, the data could not be used to make risk management decisions. Ms. Jones went on to state that she had not been informed that additional data was to be presented today regarding the DERA work plan. Ms. Jones stated that she felt that Rust E&I and the Army were under the impression that we would leave the meeting with an approved work plan, and the USEPA was not prepared to do this based on their review of the Technical Memorandum (TM). Karen Mason-Smith concurred with Brenda Jones, stating that the USEPA was under the impression that the purposes of today's meeting were to discuss the TM and to serve as a scoping meeting for the DERA work plan. John Manley added that IDEM had been out of the loop for the last 1 1/2 years since they did not have any problems with the PERA, but they did have concerns with the population studies proposed in the TM. Both John Manley and Brenda Jones stated that they agreed with the Army's proposed "No Further Ecological Evaluation Recommended" at the smaller sites as stated in the TM (specifically, Sites 1, 8, 13, 31 and 34). Additionally, for sites where the Army could show that the exposure pathways were eliminated (i.e., Site 10- the final cap on the landfill) or non-existent (Site 26, concrete pad, small fenced area in plowed field), those sites did not require further evaluation in the DERA.

Karen Mason-Smith had expressed an interest in the bat counts which had been initially proposed. Karen Fields explained that they are not truly quantitative but give an indication of relative activity. As a result, the proposed bat counts will not be conducted. Karen Fields brought up the topic of recalculating the ambient water quality criteria (AWQC) to derive site-specific AWQCs. The recalculation of AWQCs, if necessary, must follow USEPA's guidance documents. Matt McAtee expressed an interest in conducting chemical analysis on soil fauna to derive site-specific BAFs;

however, the decision had been made previously not to conduct tissue analysis because of costs and schedule impacts. Tissue sampling will be evaluated at a later date after conducting the initial DERA and evaluating any residual risks.

Celeste Marsh then presented selected slides for concurrence by the USEPA, IDEM and the Army.

Slide 18 - Site List for DERA: Ms. Marsh clarified that some of these sites would not be evaluated for 1997 field studies but had interim measures data, and therefore, would be evaluated in the DERA. IM sites include: 7&21B, 14, 15, 25, 26, 28 and 29. Sites 3 and 4 were scheduled for interim measures remediation; however, they have since been put back into the RI. Sites 25 and 26 should have their interim measures remediation completed by the end of September.

Slide 16 - Data to be included in DERA: The surface soil interval of 0-2 feet was approved.

Slide 5 - JPG Key Receptors: The list was approved as presented. USEPA commented that this was a very comprehensive list. Celeste Marsh replied that the comprehensive list was needed because of the recalculations to be done. John Manley asked if a coyote (not on the list) was going to be a receptor because he has seen lots of coyotes at the installation. Brenda Jones stated that the coyote was in the same functional feeding group as the red fox (on the list), and so long as one of these species was evaluated, this was acceptable. John Manley then asked if it would be assumed if these animals would be at the sites 100% of the time. Celeste Marsh stated that an area use factor (AUF) would be utilized. Karen Fields stated that in the PERA, 100% site utilization was assumed, but thought the DERA should not need to use 100% since it was designed to be more site-specific. Brenda Jones agreed with this statement. For the DERA, an area use factor and migratory allowance are considered acceptable.

Slide 9 - Assessment & Measurement Endpoints: See attached table reflecting changes identified as per the discussions with the USEPA and IDEM on this date. Basically, toxicity tests will replace the proposed population studies.

Slide 14 - Toxicity Reference Values - Uncertainty Factors: Brenda Jones pointed out that IDEM is usually more conservative when dealing with uncertainty factors for T&E species. John Manley stated that he will check with his ecologist (Jim Smith) as to whether the proposed uncertainty factor of 2 for T&E species is acceptable. Celeste Marsh pointed out that no T&E species had been proposed for key receptors at JPG, and that the key receptors proposed for the DERA were acceptable as presented at the meeting. Since there are no T&E or State Sensitive species proposed as key ecological receptors, the UFs as presented are acceptable to the USEPA.

Slide 15 - Background Soil Screening: The use of the Phase II combined data set was approved as presented on the slide. Calcium, potassium, sodium and magnesium will not be quantitatively

evaluated since they are macronutrients. Karen Mason-Smith reiterated that she had not received all of the Phase II background data. Specifically, she did not receive the qualified data or the site summaries. Ms. Marsh said that she will provide these as soon as possible.

The attendees went to lunch at approximately 12:45 PM, and returned at approximately 1:30 PM to resume discussions. John Manley and Carolyn Fordham left at approximately 1:30 PM.

The USACE, USACHPPM, and Rust E&I presented a revised 1997 field study scope which included site-specific soil toxicity testing for plants, soil toxicity testing for earthworms (in-situ), and soil fauna identification for sites that were not plowed. Plant toxicity testing would not be included at sites that were plowed. The soil tests would be conducted along a concentration gradient if possible based upon the results from previous investigations. Three samples were proposed at each study site. The USEPA and CH2M Hill representatives indicated that they needed some time to discuss this proposal. Approximately 30 minutes later at 2:30 PM, they returned to present their comments on the proposed field studies.

Ms. Jones requested that the table of assessment and measurement endpoints show exactly what will or has happened at each site discussed in the TM. Further, since the application of herbicides, pesticides, and /or fertilizers at the cultivated sites may be confounding factors, the USEPA proposed that Rust E&I collect 10 samples at one (or 2) sites that were relatively undisturbed and not plowed, and conduct chemical analysis, plant and earthworm toxicity tests, and soil fauna identification. Ms. Jones explained that 3 samples were not sufficient, and she recommended 10 at one (or 2) sites. The site(s) chosen should encompass all of the metals identified as COPCs in the PERA and Technical Memorandum. The intent of this approach would be to evaluate the chemical analysis data and the recalculated HQs along with the earthworm and plant data to establish a semi-quantitative, quasi-PRG soil level to be used at all of the remaining sites. Matt McAtee asked if a reference site would be required. The USEPA did not indicate whether or not this was necessary.

Rust E&I, USACHPPM, and the USACE indicated that this proposal needed to be evaluated further to determine if any proposed sites were likely candidates. Sites 3/4 were suggested by Brooks Evens and Karen Fields as the only potential sites where the USEPA proposal could be implemented.

Karen Fields discussed a few remaining issues regarding the USEPA's comments on the revised PERA. The additional Phase II data requirements needed by Karen Mason-Smith to approve the data were discussed. Celeste Marsh indicated that Rust E&I had received a memo from Karen Mason-Smith regarding the Phase II data and that she would get that information to her as soon as possible. The inclusion of Sites 46, 47, and 49 were then discussed. Karen Fields stated that since there were no analytical data available for these sites, this would be identified as a data gap for these sites in the revised PERA, and that further evaluation would occur after data had been collected for these sites. The USEPA agreed that this approach was acceptable for the PERA. Celeste Marsh indicated that if additional soil samples were going to be collected for as yet an unnamed site identified for the human health risk assessment, then these three additional sites could be included for soil sampling at the same

time provided that Glen Boldt (USAEC) and Brooks Evens (USACE) were in concurrence. Karen Fields then stated that she had contacted IDNR regarding the T&E issues, and that pending IDNR's responses, the T&E sections of the PERA would be revised accordingly. Karen Mason-Smith asked if another draft or final version of the PERA would be issued. Karen Fields stated that it was the Army's intent to have the next version serve as the final PERA document.

Schedules were then discussed. Rust E&I stated that they would like to be in the field to conduct the aquatic sampling and toxicity tests in the 2nd or 3rd week in September. Brenda Jones stated that the USEPA would like to be informed of the field work so that they would have a chance to accompany Rust E&I. Ms. Jones made the point that Rust E&I would be in the field without an approved work plan. This statement was acknowledged by Rust E&I and the Army.

The meeting was adjourned at approximately 3:00 PM with the decision to further evaluate this toxicity test proposal and respond to the USEPA with a revised Technical Memorandum. This document would then serve as an SMDP. Minutes of this meeting will be included as an appendix to the revised Technical Memorandum.

September 3, 1997

Mr. Brooks Evens
U.S. Army Corps of Engineers
Attn: CEORL-ED-GE
P.O. Box 59
Louisville, KY 40201-0059

Subject: Contract No. DAAA15-90-D-0007, Task Order 0005, Modification 000505, Transmittal of the *Revised Technical Memorandum for Jefferson Proving Ground South of the Firing Line: Proposed Assessment and Measurement Endpoints for the Detailed Risk Assessment (DERA)*

Dear Mr. Evens:

Rust Environment and Infrastructure (Rust E&I) is pleased to submit the Revised Technical Memorandum for the JPG DERA, and of the response-to-comments package. Appendix A to the revised Technical Memorandum contains the minutes from the August 14, 1997 meeting held with the USEPA, IDEM, USACHPPM, USACE, CH2M Hill, and Rust E&I in Chicago, Illinois.

Per our discussion, additional copies have been sent directly to the following:

1. Karen Mason-Smith, USEPA Region V
2. Brenda Jones, USEPA Region V
3. John Manley, IDEM
4. Matt McAtee, USACHPPM
5. Matthew Bazar, USACHPPM
6. Joe Sandrin, CH2M Hill
7. Jack Dingleline, CH2M Hill
8. Glen Boldt, USAEC
9. Karen Fields, Rust E&I
10. Carolyn Fordham, Terra Technologies

As I will be out of the office from Wednesday, September 3 through Friday, September 5, 1997, please contact John Ludlam at 970-241-9612 if you have any questions or concerns.

Sincerely,

 for C.M. Marsh

Celeste M. Marsh
Project Manager, JPG Ecological Risk Assessment

enclosures

**Response to Review Comments on the June 1997 Technical Memorandum
Proposed Assessment and Measurement Endpoints for the Detailed Ecological Risk Assessment
Jefferson Proving Ground, Indiana
September 1997**

Comments	Response to Comments
USEPA Region V	
General Comments	
<p>1. The proposed DERA approach relies heavily on population studies and comparisons of flora and fauna populations in affected areas and unaffected areas. This general approach raises many questions.</p> <ul style="list-style-type: none"> • How will the unaffected areas be selected? • What statistically approach will be used to compare the two areas? • Given that many of the affected areas are small and have been extensively disturbed by human activity, what level of study will be necessary to evaluate a statistically significant difference and, is it possible? 	<p>Following the meeting held with the USEPA, IDEM, USACHPPM, and the USACE on August 14, 1995 at EPA Region V in Chicago, Rust E&I has submitted a revised Technical Memorandum ((TM) September 1997). Population studies have been replaced with in-site earthworm toxicity tests, ex-situ plant toxicity tests, and soil microfauna identification using site soils. Three background areas will be included in these field studies as well. In addition, chemical analysis for metals in soil, pH, and organic matter content will be performed to support the interpretation of these studies and possible development of site-specific PRGs. The macroinvertebrate sampling and Rapid Bioassessment Protocol (RBP) for Harbert's Creek adjacent to Sites 2/27, proposed in the June 1997 version of the TM, will be performed as planned. A reference stream segment will also be evaluated.</p>
<p>2. Because some of the DERA sites are also interim measure sites, some soil removal has been performed at some of the sites. However, the Interim Measures Work Plan (Sites 3, 4, 7, 8, 14, 15, 26, 28, 29, and 42) and Engineering Evaluation/Cost Analysis (EE/CA) for the Interim Measures (Sites 3, 4, 7, 8, 14, 15, 26, 28, 29, and 42) do not include preliminary remediation goals (PRGs) for ecological risk, but the confirmation sampling cleanup goals are based only on human health risk. This issue must be taken into consideration and addressed.</p>	<p>It is expected that PRGs can be calculated by evaluating the data obtained from the field studies proposed in the revised TM (September 1997) and DERA work plan, which is under preparation.</p> <p>Note that Sites 3&4 have been taken out of the IM program and Site 25 has been included in the IM program and is scheduled for remediation in September 1997. Based on the PERA evaluation, Site 42 was not an ecological site of concern. The residual levels left in the soils after completion of the IM remediation activities at each site will be re-evaluated (through toxicity tests and calculation of Hazard Quotients (HQs) and Hazard Indices (HIs)) to determine if these residual levels are protective of ecological receptors.</p>

**Response to Review Comments on the June 1997 Technical Memorandum
Proposed Assessment and Measurement Endpoints for the Detailed Ecological Risk Assessment
Jefferson Proving Ground, Indiana
September 1997**

Specific Comments	Comments	Response to Comments
<p>1. Section 3.0 SITE-SPECIFIC ASSESSMENT AND MEASUREMENT ENDPOINTS</p> <p>Selection factors for the development of appropriate endpoints appear appropriate for the DERA. It should be noted, however, that assessment endpoints may be defined as more than just potential receptors, but can also include populations and associated social and environmental values. Additional consideration may wish to be given to selection of endpoints for some of the selected sites. For example, an endpoint of "plant community composition similar to that of an unaffected nearby plant community" may not be a desirable endpoint if physical disturbances of the site are likely to persist or if other factors, beyond contaminant presence, preclude development of a plant community similar to a non-disturbed reference site.</p>	<p>During the meeting held on August 14, 1997, as mentioned in USEPA general comment response No. 1 above, the assessment and measurement endpoints were approved and are presented in the revised TM (September 1997)</p>	<p>The area of stressed vegetation referred to by the reviewer is now covered with a lush growth of grass and weedy species. This area cannot be distinguished from adjacent areas, and it appears that the stressed vegetation observed in 1993 may have been the result of physical disturbance, such as trampling. This conclusion is based on the fact that the site has been undisturbed for approximately 4 years and vegetation has returned and appears healthy and robust. Additionally, since this area of concern was so small (approximately 10 square feet), no further ecological investigations are proposed at Site 1. Rust E&I is proposing to evaluate Harbert's Creek and a nearby unimpacted stream segment by collecting stream macroinvertebrates and conducting a Rapid Bioassessment at those locations. Fish will also be counted. The intent of these activities is to determine whether the depauperate stream as noted by Karns is a result of chemical contamination or whether it is due to poor habitat quality.</p> <p>Site 1 will not be included in the DERA. The USACE proposes a limited removal action by removing the visible ash in FY97.</p>
<p>2. Section 3.1 SITE 1 - BUILDING 185 INCINERATOR</p> <p>The "no further ecological investigation" action appears appropriate for the site given existing conditions. However, as stated in our July 17, 1997 letter, in Comment #5 regarding technical review comments on the <i>Revised Preliminary Ecological Risk Assessment (PERA)</i>, how will the Army assess the area of stressed vegetation located near the ash door of Building 185, and the depauperate stream of Harbert's Creek as observed by Karns? (Refer to Karns Report 1993)</p> <p>Will the Army perform confirmatory sampling in the disturbed area to see if a removal action would be warranted? How toxic is 35 mg/kg considered to be for both human health and the environment? What type of remediation is the Army proposing?</p>	<p>The area of stressed vegetation referred to by the reviewer is now covered with a lush growth of grass and weedy species. This area cannot be distinguished from adjacent areas, and it appears that the stressed vegetation observed in 1993 may have been the result of physical disturbance, such as trampling. This conclusion is based on the fact that the site has been undisturbed for approximately 4 years and vegetation has returned and appears healthy and robust. Additionally, since this area of concern was so small (approximately 10 square feet), no further ecological investigations are proposed at Site 1. Rust E&I is proposing to evaluate Harbert's Creek and a nearby unimpacted stream segment by collecting stream macroinvertebrates and conducting a Rapid Bioassessment at those locations. Fish will also be counted. The intent of these activities is to determine whether the depauperate stream as noted by Karns is a result of chemical contamination or whether it is due to poor habitat quality.</p> <p>Site 1 will not be included in the DERA. The USACE proposes a limited removal action by removing the visible ash in FY97.</p>	<p>The area of stressed vegetation referred to by the reviewer is now covered with a lush growth of grass and weedy species. This area cannot be distinguished from adjacent areas, and it appears that the stressed vegetation observed in 1993 may have been the result of physical disturbance, such as trampling. This conclusion is based on the fact that the site has been undisturbed for approximately 4 years and vegetation has returned and appears healthy and robust. Additionally, since this area of concern was so small (approximately 10 square feet), no further ecological investigations are proposed at Site 1. Rust E&I is proposing to evaluate Harbert's Creek and a nearby unimpacted stream segment by collecting stream macroinvertebrates and conducting a Rapid Bioassessment at those locations. Fish will also be counted. The intent of these activities is to determine whether the depauperate stream as noted by Karns is a result of chemical contamination or whether it is due to poor habitat quality.</p> <p>Site 1 will not be included in the DERA. The USACE proposes a limited removal action by removing the visible ash in FY97.</p>

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<p>3. Section 3.2 SITES 2 & 27 - SEWAGE TREATMENT AREA</p> <p>Endpoints for the sewage treatment area which include population structure and composition for aquatic macro invertebrate communities appear appropriate, however, there are significant concerns regarding the proposed approaches for assessing community health and associated contaminant effects. Approaches which are based on population estimates and statistical comparisons between on-site and reference locations are unlikely to effectively demonstrate contaminant related effects. This is based on the following factors:</p> <ul style="list-style-type: none"> • Natural populations are highly variable. As a result, statistically significant differences between population areas may be found only after a very large number of samples have been gathered. • In the event statistically significant differences are demonstrated between populations, it will not be possible to effectively conclude that the differences are based on contaminate related effects. They may be due to slight differences in habitat condition, habitat size, and/or natural processes such as immigration and emigration. This may be particularly true for plant communities may be affected by soil type, topographical elevation and microclimate. • Contaminants may be present in individuals in the population at levels which do not result in differences in community structure and composition between on-site and reference areas. They may, however, be present at levels which could represent risks to higher trophic level species which prey on members of the population. <p>Also, the small mammal and plant community structure endpoints are troublesome. There are standard techniques for determination of plant community structure, which makes measurements fairly easy to obtain. However, these sites are fairly disturbed by human activities. These disturbances are probably unrelated to site-specific chemical stressors. This makes locating appropriate reference areas for comparison quite difficult, and strongly complicates the interpretation of the vegetation study results.</p>	<p>See response to USEPA general comment No. 1, above.</p> <p>Due to the plowing and cultivation of the sewage sludge application areas, the proposed field studies for Sites 2/27 are limited to assessing water quality and riparian habitat at Harbert's Creek and a nearby unimpacted reference stream segment.</p>

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<p>3. Section 3.2 SITES 2 & 27 - SEWAGE TREATMENT AREA, continued</p> <p>Similar arguments can be applied to the small mammal populations and community structure assessment endpoint. However, there is an additional confounding factor that makes vertebrate sampling difficult to implement and to obtain valid results. That is the problem with natural variability. There are also issues related to problems with low sample numbers and/or replicates (which is characteristic of small mammal studies), as well as determination of mobility and home range. Presence of absence of small mammals on the site itself is not a relevant measurement endpoint for this assessment endpoint, although this information is useful in selecting assessment endpoints. In order to perform a valid small mammal population study, information on reproductive success and population structure (age and sex distribution) is necessary. Additionally, mortality in the field is extremely difficult to measure. Injured or sick animals tend to hide and studies have shown that humans rarely observe these hiding animals or dead carcasses. Usually, predators find these carcasses long before humans can observe them in the field.</p> <p>While properly designed mammal and plant population studies would be excellent measurement endpoints, it is unlikely that, given the time constraints on base clean-up, they can be appropriately applied at Jefferson Proving Ground. More appropriate measurement endpoints for these assessment endpoints may be toxicity tests. U.S. EPA has guidance on selecting toxicity tests. There are excellent toxicity tests for determination of both aquatic and terrestrial phytotoxicity and invertebrate toxicity (invertebrates serve as a food source for many small mammals) which can be used to determine potential adverse effects to the assessment endpoints. Inorganic, specifically metals, which are the primary contaminants of concern at the sites discussed in this document, lend themselves very well to toxicity testing. Additionally, toxicity testing along a range of contaminant concentrations can greatly aid in the determination of clean-up numbers (if remediation is found to be necessary). Finally, while toxicity testing may be expensive, it specifically answers the questions of whether the levels of contamination found at these sites is bioavailable at the toxicity levels projected in the Preliminary Ecological Risk Assessment (PERA). If the results of the toxicity tests indicate less toxicity than is projected in the PERA, significant remediation costs may be saved.</p>	

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4. Section 3.3 SITES 3 & 4, ABANDONED LANDFILL See above comment for Sites 2 & 27.	See response to USEPA general comment No. 1, above.
5. Section 3.4 SITES 7 & 22B, RED LEAD DISPOSAL AREA AND TEMPORARY STORAGE AREA AT BUILDING 211 Residual contaminant levels present in soil could be compared to previous concentrations developed in the PERA without extensive calculation. Reevaluation of residual levels (i.e., post-interim measure concentrations) is acceptable.	See response to USEPA general comment No. 1, above. No field investigations are planned for Sites 7/21b; however, the interim measures remediation data will be reevaluated in the DERA.
6. Section 3.5 SITE 8, SMALL ARMS FIRING RANGE The proposed action appears appropriate. As this area is planned to undergo some remediation as part of the interim measures (non-time-critical-removal action), additional assessment of this area does not appear warranted.	Comment acknowledged.
7. Section 3.6 SITES 9&10 - BURNING GROUND SOUTH OF GATE 19 LANDFILL & GATE 19 LANDFILL Additionally, this site has been substantially altered by construction of the landfill cap and it is likely that effects due to habitat disturbance may overwhelm any other effects.	Comment acknowledged. See response to USEPA general comment No. 1, above. Only the western portion of Site 9, which is outside of the landfill cap, will be evaluated in the DERA.

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<p>8. Section 3.7 SITES 11, BURNING AREA FOR EXPLOSIVE RESIDUE</p> <p>See above comment for Sites 2 & 27 for the plant and mammal studies. Reevaluation of residual levels (i.e., post-interim remedial action concentrations) is acceptable.</p> <p>Additional assessment of Site 11 may be warranted following remediation, if clean-up goals for the site are above ecological risk levels. In addition, meaningful statistical comparisons between this site and a selected reference location are unlikely, based on factors previously described. Proposed remedial actions for this site are also likely to significantly disturb soil, existing plant communities, and wildlife habitat. As a result, any differences between this site and a reference location may be due to the physical disturbance of the site rather than residual contaminant concentration.</p>	<p>Comment acknowledged. See response to USEPA general comment No. 1, above.</p>
<p>9. Section 3.8 SITE 13, OLD FIRE TRAINING AREA</p> <p>Conclusion regarding potential ecological risk for this site appear appropriate.</p> <p>What type of remediation has been recommended for this site, by the Army, in the Remedial Investigation (RI) Report?</p>	<p>Comment acknowledged.</p> <p>The RI report (Rust E&I July 1994) had recommended No Further Action; however, Phase II data will be incorporated in revised RI report</p>

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<p>10. Section 3.9 SITE 14, YELLOW SULFUR DISPOSAL AREA</p> <p>See above comment for Sites 2 & 27 for the plant and mammal studies. Reevaluation of residual levels (i.e., post-interim remedial action concentrations) is acceptable. If contaminated soils for the site have been removed, additional assessment may not be warranted. However, please take into account that the soil removal confirmation sampling cleanup goals are based solely on human health risk and not ecological risk.</p> <p>In addition, in the event remedial measures for the site involve placement of a clean fill dirt cover over the site, potential routes of exposure for small mammals and plant, may be truncated. If not, additional assessment may be appropriate. Population level sampling of small mammals and plant communities are unlikely to produce meaningful results for reasons described in Section 3.2. Additionally, this site uncovered unsuspected unexploded ordnance (UXO) during the initial removal action. Has the area been cleared of UXO, and is it even possible to proceed with other work in this location at this time?</p>	<p>See response to USEPA general comment No. 1, above.</p> <p>According to the USACE (8/28/97), this area has not yet been backfilled. Backfill will be completed upon approval from USEPA. No further UXO clearance is planned unless more excavation is required. It is not OK to proceed with work at this location until approval has been received from USEPA.</p>
<p>11. Section 3.10 SITE 15, BURN AREA SOUTH OF NEW INCINERATOR</p> <p>(See comments to Section 3.9 Site 14, Yellow Sulfur Disposal Area above with the exception of the comment on uncovered UXO.) To our knowledge, UXO has not been discovered at this site. However, please note that there is a potential to find unsuspected UXO anywhere at JPG.</p>	<p>Comment acknowledged. See response to USEPA general comment No. 1, above.</p>
<p>12. Section 3.11 SITE 25, PAPERMILL ROAD DISPOSAL AREA</p> <p>Given the size and current habitat condition at the site, as well as persisting evidence of previous physical disturbance at the site, e.g., asphalt, clinkers, additional ecological assessment in the form of population sampling appears unwarranted. See above comment to Site 2 & 27 for the mammal studies. U.S. EPA agrees that no additional vegetation studies are necessary</p>	<p>Comment acknowledged. See response to USEPA general comment No. 1, above.</p> <p>Site 25 is scheduled to undergo interim remedial measures in September 1997. Residual levels of site contaminants following this action will be used to calculate new HQs and HIs for this site, and toxicity tests will be conducted at this site.</p>

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<p>13. Section 3.12 SITE 26, DRMO STORAGE AREA</p> <p>See above General Comment #3 regarding Sites 2 & 27. Reevaluation of residual levels (i.e., post-interim remedial action concentrations) is acceptable.</p>	<p>During the meeting with the regulators (August 14, 1997), Site 26 was recommended for no further ecological investigations. The small area in the field was inadvertently plowed in the spring of 1997 and subsequently remediated through the interim measures program. The remediated area was backfilled with clean soil and has not been disturbed since that time. The fenced area is mostly covered with asphalt, concrete, or crushed gravel and is scheduled to be remediated in September 1997 along with Site 25. Evaluation of the residual levels could be conducted; however, there are no completed exposure pathways for these areas and little or no ecological habitat; therefore, no further ecological evaluations are planned for this site.</p>
<p>14. Section 3.13 SITES 28, 29, AND 39, GATOR Z AREA</p> <p>See above General Comment #2 and Specific comment # 3, Specific comment # 8, and Specific Comment #10. Please address the issue regarding the suspected UXO and UXO related scrap metal, etc. that was uncovered during the initial removal action. Has the area been cleared of UXO, and is it even possible to proceed with other remediation work in this location at this time?</p>	<p>See response to USEPA general comment No. 1, above.</p> <p>According to the USACE (8/28/97), Site 28 has been cleared for UXO down to 2 feet; Site 29 has been only partially cleared for UXO; Site 39 has not cleared for UXO. It is not OK to proceed with further remediation at Sites 29 and 39 until UXO clearance has been completed.</p>
<p>15. Section 3.14 SITE 31, BUILDING 227 FORMER STORAGE PAD</p> <p>The recommendation of "no further ecological investigation" appears appropriate. What type of remediation has been recommended for this site, by the Army, in the RI Report?</p>	<p>Comment acknowledged.</p> <p>The RI report (Rust E&I July 1994) recommended No Further Action. No Phase II data were collected at this site.</p>
<p>Indiana Department of Environmental Management</p>	
<p>General Comments</p>	
<p>1. IDEM staff agree with the recommendation of no additional ecological studies at several sites due to the small size of the site.</p>	<p>Comment acknowledged.</p>

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<p>2. IDEM staff have several concerns with proposed population studies which include:</p> <ul style="list-style-type: none"> • Data collected on population status of small mammals and plants will be of little value unless several years of data collection are planned. A single year's data will not show measurable effects or distinguish the variations in natural populations. • Population variations will overshadow effects of Contaminants of Concern (COC) on the populations observed at these sites. Additionally, the level of human activity at various sites will be a factor in population variations. • Studies on individual impacts (reproductive impairment, tissue concentrations, size, etc.) at contaminated and unimpacted sites would be more productive than biometric studies. 	<p>See response to USEPA general comment No. 1, above.</p>

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<p>Section 3.11, Page 8</p> <p>Site #25 has been added as an "Interim Measures" site and contaminated soil will be removed. A new screening level assessment should be conducted using confirmation sampling data at the new exposure concentrations. The new screening level assessment will determine if the residual COCs levels are protective of site flora and fauna.</p> <p>Beryllium has been detected at elevated levels at this site in the Remedial Investigation Phase I and II sampling. Why isn't beryllium a COC for this site?</p>		<p>See response to USEPA general comment No. 1, above.</p> <p>Interim measures data will be re-evaluated as suggested. Beryllium was a listed as a potential COC in the PERA, which utilized strictly Phase I site data, but was determined not to pose an ecological risk. Phase I, Phase II, and interim measures remediation data will be evaluated in the DERA as explained during the August 14, 1997 agency meeting and as detailed in the DERA work plan.</p>